SECTION 1

FISH AND WILDLIFE MITIGATION PLANNING

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FISH AND WILDLIFE MITIGATION PLANNING

INTRODUCTION

The construction of a large civil works project in a remote area such as Bayou Sorrel typically causes adverse impacts to fish and wildlife habitats. The selected project design should avoid and minimize adverse impacts as much as practicable, considering the monetary cost of doing so. In the case of the Bayou Sorrel lock replacement, the most practicable location for the lock structure and the connecting channels was quite obvious to the personnel involved in the study at a very early stage. Other potential locations would have meant considerably more loss of fish and wildlife habitat and higher construction costs due to the longer connecting channels required. Also, relocation of more local residents and the vehicular bridge across the GIWW would have been necessary for the other possible alignments. There are not any other viable locations for a new lock other than the general area that was selected. Only small variations in the alignment of the new lock structure are possible due to the close proximity of the East Atchafalaya Basin Protection Levee (EABPL), the East Access Channel, and the existing lock. One problem with the chosen lock replacement site is its proximity to the original construction site for the Bayou Sorrel lock. A soil failure, which consisted of a slumping of material into the excavated area, occurred at that site during construction, causing abandonment of that location. That problem occurred around 1950. The lock was eventually built a short distance to the south and east of the original excavation site. Modern engineering and construction techniques will allow construction of a new lock in the vicinity of the original construction site.

The lock structure and chamber would be constructed in a previously disturbed area, which does not provide high quality fish or wildlife habitat. The area consists of a borrow pit, young black willow woodland, and disturbed bottomland hardwood forest habitat. The connecting channels for the new lock would be dredged through existing channels, disturbed bottomland hardwood forest, and dredged material disposal sites. These disposal areas provide wildlife habitat of moderate value during normal water levels in the Atchafalaya Basin Floodway, but provide important escape cover and refuge during high water. Impacts have been quantified for all areas that would be impacted from project construction.

AVOIDANCE AND MINIMIZATION

The site for the new lock and the new connecting channels was determined early in the study for the reasons stated above. Therefore there was no opportunity to minimize the impacts of these features on fish and wildlife habitats. The lock grounds would have to cover as much

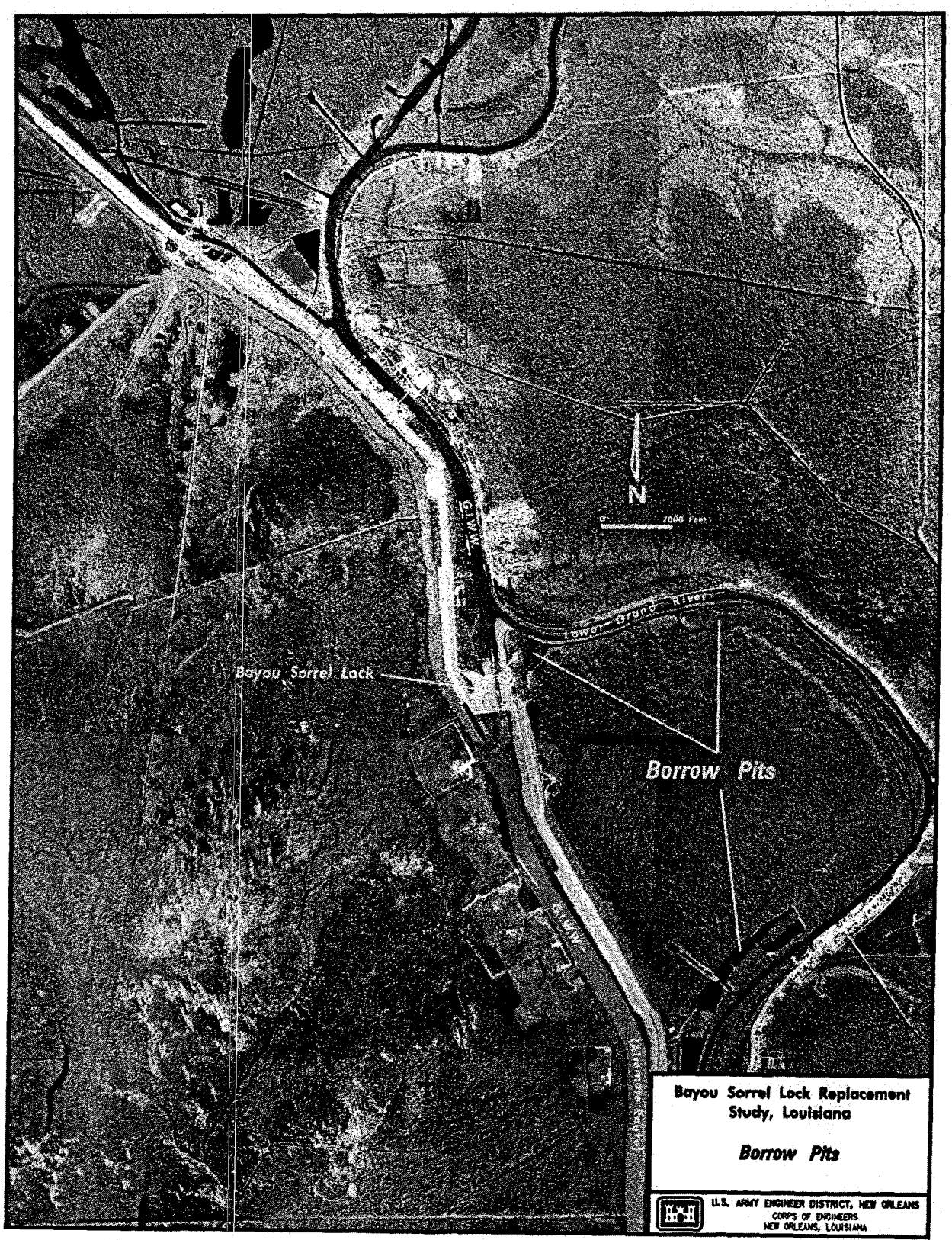
acreage as necessary for lock operations and the connecting channels would need to have sufficient radius curves in order to allow barge tows to operate safely.

The greatest opportunity to avoid and minimize the potential adverse impacts of construction of a replacement lock was determined to lie in the disposal of material dredged from the access channels. Several million cubic yards of alluvial sediments will need to be removed from the channel right-of-ways. Unfortunately, the south entrance channel and re-aligned East Access Channel would need to be constructed through some of the highest land in the vicinity – dredged material disposal areas that are filled to capacity. This is where the greatest amount of material would need to be dredged.

The method used for maintenance dredging of the GIWW in the vicinity of Bayou Sorrel is hydraulic dredging and disposal into confined disposal areas along the west bank of the East Access Channel and GIWW. Maintenance dredging occurs on an annual basis, usually in the summer after the Atchafalaya River has fallen from its spring rise. Confined disposal causes the conversion of cypress swamp and wet bottomland hardwood forest to a less-desirable, non-flooded habitat, comprised mainly of black willow and sycamore woodlands. At present there are seven confined disposal areas covering approximately 370 acres in the vicinity of Bayou Sorrel. All of the disposal areas are located within the Atchafalaya Basin Floodway.

Since the mid-1800's, when a massive logjam was cleared from the head of the Atchafalaya River, the Atchafalaya has deposited significant mounts of silt within its basin. During the 20th Century, much of the historic open water areas converted to black willow swamps, and cypress swamps converted to bottomland hardwood forest due to the siltation from the annual flood events on the river. Even though the bottomland hardwood forest provides excellent wildlife habitat (and fish habitat during high water periods), government resources agencies and the public are concerned about the continued conversion of cypress swamp into bottomland hardwood forest. The cypress swamp generally provides better habitat for swamp crawfish, which is commercially harvested extensively throughout the floodway, and especially in the vicinity of Bayou Sorrel. For this reason, the creation of new dredged material disposal areas in cypress swamps and bottomland hardwood forests in the floodway for project construction should be avoided to the maximum extent practicable.

A number of borrow pits are located in the general vicinity of Bayou Sorrel. Most of these borrow pits were excavated to provide fill for the EABPL. All of the pits occur outside of the Atchafalaya Basin Floodway. These pits provide an opportunity to dispose material dredged for project construction in a manner that does not significantly affect forested lands within the Atchafalaya Basin Floodway. Two pits are located in close proximity to the areas to be dredged, while others are located south of the Bayou Sorrel lock near the community of Bayou Pigeon. The locations of the pits are shown in Figure 1.



Bayou Sorrel Lock Replacement Study, Louisiana

Borrow Pits

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

Figure 1

HABITAT ANALYSIS

The decision as to which habitat analysis technique to use was based on a desire to easily and accurately determine project impacts and the amount of compensatory mitigation required. Habitat analysis techniques used in the past for projects in the Lower Mississippi Valley include the U.S. Fish and Wildlife Service's (USFWS) Habitat Evaluation Procedures (HEP) and the USACE, Mississippi Valley Division's Habitat Evaluation System (HES). Both of these habitat evaluation techniques are applicable to the project area. The HEP can be quite cumbersome and the results are dependent upon the species chosen for evaluation. In this way, the HEP can be subjective. The HES is fairly easy to apply, but has not been accepted by the USFWS. Also, the HES does not take hydrology into consideration, which is of considerable importance in the project area.

The chosen habitat evaluation technique is the Habitat Assessment Model (HAM), which was derived from the HEP. An assemblage of variables considered important for determining the suitability of an area to support a diversity of fish and wildlife species are used. HAM models are available for bottomland hardwood forest and for freshwater swamp. The prototype of this evaluation technique was developed for projects being evaluated under the Coastal Wetlands Planning, Protection and Restoration Act of 1990. The Louisiana Department of Natural Resources refined the technique for use primarily in impact analysis and mitigation planning for Coastal Use Permits issued under the authority of the Coastal Zone Management Act. Very similar models are used to evaluate benefits of wetland restoration projects in the fresh, brackish, and saline marshes in the coastal zone of Louisiana. Louisiana's state agencies are required by their regulations to use only the HAM for permit impact analysis and mitigation planning in wooded wetlands of the Louisiana Coastal Zone. Additionally, the USACE, New Orleans District often uses HAM when assessing affects of projects for which permits are required under Section 404 of the Clean Water Act.

USACE and USFWS biologists conducted field investigations to collect the data necessary to assess existing conditions in the area. Forested habitats were divided into sub-areas designated "A" through "T", based on differences and similarities in habitat. These sub-areas are shown on Figure 2. Some of these areas would be only indirectly affected by the proposed project. Most of the area to be directly impacted by project construction and maintenance is classified as bottomland hardwood forest. A relatively small amount of cypress swamp would also be impacted. The existing conditions of the various sub-areas, in terms of the habitat variables contained in the HAM, are shown in Table 1.

PROJECT IMPACT ASSESSMENT METHODOLOGY

In order to determine the impacts of the project, the future condition of the area was projected for the future with-project and without-project conditions. The difference in total habitat quantity between the two conditions was used to determine the impacts of the project.


Bayou Sorrel Lock Replacement Study, Louisiana
HABITAT AREAS EVALUATED
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
(Alternate Route)
G.I.W.W.
Bayou Sorrel Lock
Lower Grand River
East Access Channel
0
2000 Feet
N

Figure 2

TABLE 1
BAYOU SORREL LOCK REPLACEMENT - EXISTING HABITAT CONDITIONS

Bottomland Hardwood Habitats

Area	V1		V2	V3		V4	V5	V6	V7	
	Mast (percent)	Hard Mast (percent)	Maturity (DBH[1])	Understory (percent)	Midstory (percent)	Hydrology (value)	Forest Size (value)	Surrounding Land Use (value)	Disturbance (value)	Sites Used
A	42.5	15.0	13.5	25.0	82.5	1.00	0.6	0.59	0.5	8a and 9a
B	95.0	0.0	13.9	25.0	20.0	0.75	0.2	0.58	0.5	5b
C	95.0	0.0	11.0	75.0	40.0	0.75	0.6	0.57	0.5	1b
D	0.0	0.0	8.0	95.0	80.0	0.75	0.6	0.58	0.5	2b
E	0.0	0.0	3.3	40.0	40.0	0.75	0.6	0.55	0.5	3b
F	100.0	75.0	12.8	55.0	40.0	0.50	0.6	0.54	0.5	4b
G	68.3	5.0	9.6	23.3	13.3	0.50	0.6	0.52	0.5	6b, 7b, & 8b
H	10.0	0.0	10.7	45.0	75.0	0.37	1.0	0.81	1.0	7a
I	0.0	0.0	17.5	95.0	40.0	0.50	1.0	0.81	1.0	6a
J (not impacted)	0.0	0.0	<1.0	90.0	10.0	0.50	1.0	0.81	1.0	4a
K	20.0	0.0	9.4	70.0	80.0	0.75	1.0	0.81	1.0	5a
L (not impacted)	76.7	43.3	10.3	60.0	60.0	1.00	1.0	0.81	1.0	1a, 2a, & 3a
M (not impacted)	95.0	40.0	14.3	10.0	80.0	1.00	1.0	0.81	1.0	11a
N	0.0	0.0	3.0	75.0	80.0	0.10	1.0	0.81	1.0	2c
O (BLH part)	20.0	0.0	10.1	70.0	80.0	0.50	1.0	0.81	1.0	5a
Q (not assessed)										
R & S	0.0	0.0	3.0	75.0	80.0	0.10	1.0	0.81	1.0	2c
T	95.0	40.0	14.3	10.0	80.0	1.00	1.0	0.81	1.0	11a
U (not assessed)										

Cypress/Tupelo Swamp Habitats

Area	V1			V2			V3	V4	V5	V6
	Overstory Canopy (%)	Midstory (%)	Herbaceous (%)	Cypress (%)	DBH[1] Cypress	DBH[1] Others	Hydrology (value)	Forest Size (value)	Surrounding Land Use (value)	Disturbance
P, Y, & O (C/T part)	60.0	75.0	40.0	35.0	13.4	9.0	1.0	1.0	0.81	1.0

[1] DBH - Diameter at Breast Height in inches

[2] HAM - Habitat Assessment Model

The primary fish and wildlife impacts of the project are related to two major categories – 1.) the lock and channel footprint and 2.) dredged material disposal activities. Dredged material disposal activities can produce either adverse or beneficial impacts, by either adversely affecting good quality existing habitat or by creating new terrestrial habitat in open water areas. Dredged material disposal areas and methods have been designed to maximize beneficial impacts to fish and wildlife habitats, while minimizing adverse impacts to the maximum extent practicable.

The first step in the quantification of impacts, after avoiding and minimizing impacts to the maximum extent practicable, is to determine the areas to be affected and to document the existing condition of the habitat. After that, the future condition of the impact area in the absence of the project (future without-project) has to be projected. Next, the future condition of the area with the project must be determined. The period of analysis for navigation projects is typically 50 years, since this is the normal economic life of navigation projects. The difference in the habitat available between the future without project condition and the future with project condition, annualized over the life of the project, is the impact of the project.

The HAM is based on the assumption that habitat values of bottomland hardwood forests and cypress swamps for dependent fish and wildlife resources can be determined by measuring a set of variables. Each variable is used to generate a suitability index with a value of 0.0 to 1.0. The suitability indices are inserted into a formula, which generates a habitat suitability index (HSI), also on a scale of 0.0 to 1.0. The HSI is a measurement of the habitat value. An HSI of 0.0 means the habitat has no value, while a rating of 1.0 would mean the habitat is optimal for dependent fish and wildlife resources. As an example, 1 acre of habitat with an HSI of 1.0 would provide the same amount of habitat as 10 acres with an HSI of 0.1. The last column in Table 1 shows the existing HSI of each sub-area.

FUTURE WITHOUT PROJECT CONDITION

The HSIs of most sub-areas are expected to gradually increase over time, under the future without-project condition, due to an increase in the average size of the trees. Tree size is a heavily weighed variable in the HAM. Other variables are generally expected to remain about the same. Some sub-areas would be impacted by the deposition of dredged material from maintenance dredging in the absence of a lock replacement project. Periodic placement of dredged material would prevent trees from maturing by burying their root systems. Therefore, the HSIs of such sub-areas would remain the same or be reduced over time.

Annual maintenance dredging is required in the vicinity of Bayou Sorrel. Dredging normally occurs at the confluence of the East Access Channel and the entrance channel to the Bayou Sorrel lock, and extends south (downstream) as much as 3 miles. A number of confined dredged material disposal sites have been developed to dispose of this dredged material. A new disposal site was developed as recently as 1996. Even though existing disposal sites would continue to be used, it is projected that an additional site would be developed to accommodate

material from maintenance dredging, if a new lock were not constructed. The location where the new disposal area would likely be constructed is shown as sub-area "T' on Figure 2. The approximate year when the new area would be constructed is 2025.

Construction of a new disposal area would convert bottomland hardwood forest and/or cypress swamp into less desirable willow and sycamore woodlands. Sometimes the conversion is not completed until material from several dredging cycles is deposited when sediments cover the root systems and kill the dominant trees.

MITIGATION OPTIONS CONSIDERED

1. General. Mitigation planning for USACE civil works projects requires a long-term commitment of resources to assure that mitigation features are maintained over the project life. In order to assure this long-term commitment, mitigation is normally accomplished on public lands or on land that is acquired in fee by the U.S. Government for mitigation purposes. On occasion, mitigation is accomplished on land held by a responsible non-profit organization such as the Nature Conservancy or Ducks Unlimited.

Options for compensatory mitigation in the Bayou Sorrel vicinity are very limited since nearly all of the land is either developed or is already forested and providing desirable fish and wildlife habitat. Mitigation options in Iberville Parish, where the lock is located, were investigated. The Iberville Parish government was consulted, as well as state and Federal resource agencies. No viable mitigation options could be developed in Iberville Parish, except for a plan for mitigating on lands associated with the proposed project. The parish contains plenty of agricultural lands that could possibly be purchased and converted back into forest for mitigation credit, but no entity could be found that would be willing to manage the relatively small acreage that would be necessary to mitigate for project construction. Mitigation planning efforts were concentrated on avoiding and minimizing project impacts and compensating for unavoidable impacts through management of dredged material disposal areas for maximum wildlife habitat value.

A number of mitigation options were investigated for impacts stemming from the lock replacement. Those options are as follows:

A. Water management in the Atchafalaya Basin. This option consists of constructing cuts or gaps in the high banks of waterways within the basin to allow headwater flows to enter the swamps, thereby improving water quality and vegetative growth. Published studies by the EPA have documented the negative effects of spoil banks on water quality in the basin, and major efforts are underway in other parts of the basin to direct headwater flows into the swamp to avoid alleviate stagnant water conditions. One potential problem with these plans is that silt will enter the swamp along with the water. As stated previously, siltation in the basin is converting swamp into bottomland hardwood forest, which is undesirable from most perspectives. The USFWS, in

cooperation with USACE regulatory permit personnel have attempted to quantify the potential benefits of this mitigation option using the HAM. The analysis shows there is minimal benefit attributable to bank gapping, according to the HAM. However, the HAM is not sensitive to changes in hydrology, and does not take water quality into account. The lack of headwater flows into the swamp is documented as a major cause of poor water quality, and is a prime factor in limiting fisheries production.

The dredged material disposal sites along the west bank of the East Access Channel prevent overbank flow along about 1.5 miles of the bank. As a result, low dissolved oxygen conditions occur in the swamp to the west of the disposal sites. Constructing a new ditch through the disposal areas to connect the East Access Channel to the swamp during high water periods, and maintaining an existing ditch, would significantly improve water quality and fisheries production in a several thousand-acre area.

B. Fill-in existing borrow pits and restore bottomland hardwood forest. This option is available for a number of borrow pits in the vicinity. These existing borrow pits offer an opportunity to dispose of dredged material without significantly affecting woodlands. Some disturbance of woodlands adjacent to borrow pits may be necessary for dike construction, but these impacts would be relatively minor. Although the borrow pits provide habitat for fish and feeding habitat for some birds, they are not part of the natural environment, and their conversion back to woodlands could provide mitigation for some project impacts.

One of the limiting factors to this option is the lack of a willing local sponsor to assume maintenance of the small, isolated, and disconnected sites. Past experience with management of Government lands in the USACE, New Orleans District has shown that isolated tracts are virtually impossible to manage effectively, and vandalism, illegal tree cutting, trash dumping, and other unapproved activities cannot be prevented. Given this constraint, only the borrow pit adjacent to the existing Government property would be acceptable for compensatory mitigation. The other borrow pits could still be used for disposal of dredged material, but no compensatory mitigation credits could be claimed since there would be nothing prohibiting the property owners from removing the material. Even if the borrow pits are not used for mitigation credit, the use of the pits for dredged material disposal would avoid some of the overall project impact on forested lands, thereby reducing the amount of compensatory mitigation required. The use of 2 pits, plus a canal connecting them, for dredged material disposal, is part of the proposed project plan.

C. Plant existing dredged material disposal areas with desirable trees and manage. This option is available for dredged material disposal areas that are filled or nearly filled to capacity. The U.S. Government would have to purchase the property in order to assure that the property would remain wildlife habitat. The Government only has dredged material disposal easements on the disposal areas currently. Mitigation credit would be obtained by calculating the difference between the habitat value of the area with management and without management over the project life of 50 years. This option is part of the project mitigation plan.

D. Avoidance of creating new dredged material disposal areas for channel maintenance dredging. Under the future without project condition, new dredged material disposal areas would be required for disposal of material dredged during the annual dredging of the GIWW near the Bayou Sorrel lock. These new disposal areas would be built in cypress swamp and bottomland hardwood forest within the floodway. If a new lock is constructed, the existing lock's chamber, and forebay and tailbay channels, could be used for disposal of material from maintenance dredging for up to 35 years. These disposal areas could be planted with desirable trees and managed as they are filled to capacity. Existing disposal areas in the floodway would be used for the remainder of the project life. So the creation of new disposal areas would not be necessary, and impacts would be avoided. This option is part of the proposed project mitigation plan.

E. Utilize existing dredged material disposal areas for material dredged during project construction, plant with desirable trees, and manage. There are several dredged material disposal areas in the floodway that are filled to various levels of capacity. Some of these areas would be purchased in fee by the U.S. Government as part of the overall project then filled to capacity during project construction. The areas could be managed to achieve their maximum habitat potential. This option is part of the proposed project mitigation plan.

F. Purchase active or fallow agricultural lands elsewhere in the Atchafalaya Basin Floodway, plant with desirable trees, and manage. Thousands of acres of former agricultural lands within the Atchafalaya Basin Floodway have been purchased from willing landowners and converted into bottomland hardwood forest through planting of seedlings and management. Most of this land is in the part of the floodway that lies just north of Interstate Highway 10, about 25-30 miles northwest of Bayou Sorrel. The USACE land in the area is called the Bayou Des Ourses area and is jointly managed by the USACE and the Louisiana Department of Wildlife and Fisheries. The Atchafalaya National Wildlife Refuge and the Sherburne State Wildlife Management areas are also located in the area, with some boundaries adjoining the USACE properties. The purchase and reforestation of former agricultural or cutover tracts in this area is a viable mitigation option, but it is dependent on the availability of suitable lands. Most of the landowners willing to sell their properties have already done so, but there could be tracts available in the future. Any land purchased and used for mitigation in this area could be incorporated into the USACE Bayou Des Ourses area.

Options for mitigating the project impacts in the Bayou Sorrel area were thoroughly explored. Virtually all of the land in the area is either developed with residences or businesses or is already forested, offering no reasonable options for gaining mitigation credits. Through discussions with local government officials and state and Federal resource agencies it was determined that options for mitigation of direct project impacts were extremely limited in the area.

An attempt was made to provide for mitigation of project-related impacts in the vicinity of Bayou Sorrel, preferably either on or contiguous with the Government-owned property

associated with the Bayou Sorrel lock. It was determined that any mitigation sites in the Bayou Sorrel area would need to be either on property already owned by the Government; on property that will be acquired by the government for construction of the new lock and channels; or lands that would be contiguous with the Government-owned property. The reason behind this determination is that the Corps would be the manager of the property since there is no local sponsor for this project and no entity could be found to manage the relatively small amount of land that would be necessary to mitigate for the project. Experience by the USACE, New Orleans District in other areas of the Atchafalaya Basin has shown that small tracts of isolated land cannot be effectively or efficiently managed.

After extensive analysis, it has been determined that the project lands could provide adequate mitigation for project impacts. The mitigation plan makes use of all available project land and existing government property at the Bayou Sorrel lock. In other words, the analysis shows that project lands could provide sufficient mitigation according to the HAM with no excess mitigation credit. The only other option would have been to go far outside of the project area searching for potential mitigation sites. A likely scenario in such case would have been to find agricultural, pasture, or clearcut lands, purchase the land from willing sellers, reforest the areas, and then manage the lands. The most likely area for this mitigation option is the area around the Corps' Bayou Des Ourses management area, the USFWS' Atchafalaya Basin National Wildlife Refuge, and the State of Louisiana's Sherburne Wildlife Management Area.

QUANTIFICATION OF PROJECT IMPACTS AND MITIGATION NEEDS

ER1105-2-100, the Planning Guidance Notebook, specifies procedures to be followed for cost effectiveness and incremental cost analysis of mitigation increments. According to the ER, mitigation features are to be displayed as increments, with the cost per unit of environmental output increasing with each additional increment.

Impacts have been quantified for all areas directly affected by project construction. The results, by area affected, are shown in Table 2. The total impacts of project construction are calculated to be 70.10 AAHUs. Project maintenance with a new lock, which includes maintenance dredging of the GIWW in the vicinity of the lock, has been designed so that it would avoid adverse impacts and maximize beneficial effects.

TABLE 2
BAYOU SORREL LOCK REPLACEMENT PROJECT
PROJECT IMPACTS WITHOUT MITIGATION

AREA	AREA LOCATION	EXISTING HABITAT TYPE	ACRES	FWOP AAHUs	FWP AAHUs	NET AAHUs
A	New forebay, just south and west of existing lock	BLH	2.8	2.01	0.05	-1.96
B	New forebay, isolated patch of BLH just west of existing lock	BLH - isolated	2.7	1.98	0.05	-1.93
C	New lock site	BLH - disturbed	6.0	4.56	0.04	-4.52
D	New lock site and new tailbay	BLH - disturbed	21.6	11.33	0.08	-11.25
E	New lock tailbay	Re-generating willows (borrow pits not included)	2.8	1.33	0.01	-1.32
F	New lock tailbay	Small area of mature BLH	3.0	2.50	0.06	-2.44
G	Northern end of new lock tailbay	BLH	12.7	8.53	0.20	-8.33
H	BLH in path of new lock forebay, west of existing East Access Channel	BLH with some cypress	20.3	10.63	0.43	-10.20
H_1	BLH along East Access Channel between channel and disposal areas	BLH with some cypress - altered hydrology only	10.5	6.08	5.51	-0.57
I	Northernmost existing disposal area - part of new East Access Channel	BLH composed entirely of large, tall willows	12.9	4.17	0.33	-3.84
I_1	Northernmost existing disposal area - to be used for disposal	BLH composed entirely of large, tall willows	24.5	7.94	6.46	-1.48
I_2	Northernmost existing disposal area - to be used for disposal	BLH composed entirely of large, tall willows	24.9	8.07	6.57	-1.50
K	Northernmost part of new East Access Channel alignment	Mixed BLH - some small red maple and willows	10.2	6.53	0.21	-6.32
K_1	West side of East Access Channel, north of disposal areas - to be used for disposal	Mixed BLH - some small red maple and willows	4.1	2.62	1.03	-1.59
N	Existing disposal area - part of new East Access Channel	Mostly small willows and sycamores	21.5	7.34	0.22	-7.12
N_1	Existing disposal area - to be used for disposal	Mostly small willows and sycamores	17.2	5.88	4.14	-1.74
N_2	Existing disposal area - to be used for disposal	Mostly small willows and sycamores	42.7	14.59	10.60	-3.99
		Total	240.4	106.09	35.99	-70.10

AAHUs - Average Annual Habitat Units

BLH - Bottomland Hardwood Forest

Areas of Adverse Habitat Impacts -

Dredged Material Disposal Areas - 143.7 acres

BLH (Not In Disposal Areas) - 96.7 acres

Resulting Habitats -

Channels - 88.9 acres

Lock Grounds (Areas C&D) - 27.6 acres

Dredged Material Disposal - 113.4 acres

Altered Hydrology Only - 10.5 acres

The proposed mitigation for project impacts is derived from 4 major categories. These categories are as follows:

1. Existing dredged material disposal areas would be used for disposal of material from channel construction up to the limit of their capacity. The areas would be planted with desirable mast-producing tree seedlings and managed by reducing competition from undesirable trees. Monitoring and planting additional seedlings would be necessary to establish viable, mast-producing forest community. There is no real estate cost for this mitigation feature since the disposal areas, which are now under perpetual disposal easements, would be purchased in fee for project construction since they would become "uneconomic remnants". The cost of acquisition would be borne by the project construction cost, not the project mitigation plan. The only costs associated with this mitigation feature are for planting desirable vegetation and monitoring and managing the area. A total of 9.09 AAHUs are derived from this mitigation category.

2. The existing lock's forebay and tailbay channels, as well as the lock chamber, would be filled with material dredged from the re-routed East Access Channel. When these new disposal areas become filled to capacity, they would be planted and managed as described above. There is no real estate cost associated with this plan since the Government already owns these areas. The cost of disposing dredged material in such a manner is estimated to be no costlier than the current method of dredged material disposal. The only cost associated with this mitigation feature is the cost of planting and monitoring and managing the area. A total of 13.51 AAHUs are derived from this mitigation category.

3. The disposal of dredged material as described in paragraph 2 above, would accommodate material dredged during project maintenance for an estimated 35 years after project construction. This would eliminate the need for disposal of dredged material in existing disposal areas, and it would postpone the need to develop new disposal areas within the Atchafalaya Basin Floodway. The project is credited for the environmental benefits that would accrue from avoiding the expansion of disposal areas that would be necessary under the future without project condition. There is no cost associated with this mitigation feature. A total of 49.73 AAHUs are derived from this mitigation category.

4. A new ditch would be constructed through existing dredged material disposal sites to connect the East Access Channel with the swamp to the west of the disposal sites. The ditch would contain a sediment trap near its origin at the East Access Channel in order to limit the amount of sand and silt that is carried into the swamp by the ditch. A sediment trap would also be built on an existing ditch located along the northern boundary of existing disposal sites. These features would be built during project construction. These mitigation features are designed to mitigate for the conversion of wet, bottomland hardwood forest that would be mitigated by the development of more upland-type habitat that does not get periodically flooded. The HAM does not adequately capture the environmental effects of this change in habitat type. This mitigation feature also mitigates for the blocking-off of headwater flows into the swamp

caused by the existing confined disposal areas. This mitigation feature therefore serves two purposes – mitigation and environmental restoration.

Benefits attributable the ditches described above are difficult to quantify. It is estimated, from analysis of water color patterns on aerial photography and field observations, that approximately 1,000 acres of habitat is being adversely affected by the presence of the dredged material disposal areas along the East Access Channel. Attempts have been made by the USFWS and other state resource agencies to quantify benefits in terms of AAHUs commonly used in habitat evaluations. However, the available models do not adequately capture the benefits of water quality. There is some unpublished and anecdotal evidence that tree growth is higher in swamp areas exposed to headwater flows, but no published documentation could be found. It is well known and published that fish yields are higher in headwater swamps compared to backwater swamps. The conclusion here is that District personnel, the USFWS, other resources agencies, and local fishermen all recognize there is a problem with the dredged material disposal areas at Bayou Sorrel blocking overbank river flow, but there is no published information or existing habitat evaluation model that can be used to document this effect. This mitigation increment is being proposed because there is a recognized need for addressing a water quality problem caused by past and present USACE dredged material disposal activities in the Bayou Sorrel area.

The mitigation features 1 through 3 above are summarized in Table 3. The total amount of mitigation credit attributable to these mitigation features is 72.33 AAHUs. This level of mitigation compensates for about 103 percent of the adverse project impacts. The last increment of mitigation contributes 4.76 AAHUs. Without the last increment, only 96 percent mitigation is achieved. For this reason, all of the mitigation features shown in Table 3 are proposed for implementation.

The costs associated with mitigation items 1 through 3 above, are the costs necessary for preparing the mitigation areas for planting, reducing competing vegetation, replanting as necessary to replace dead seedlings, and monitoring the mitigation sites. These various mitigation activities and associated costs are shown in Table 4. The total cost of these items is $202,040 (plus 25 percent contingency for a total of $252,550).

The cost associated with item number 4 above (the ditching option) is estimated to be about $200,000 (plus 25 percent contingency for a total of $250,000). The total estimated cost of mitigation is therefore $502,550 (first cost). No real estate costs are associated with the fish and wildlife mitigation plan. All lands to be used for mitigation would be acquired in fee by the Federal government as part of the project. Some parcels would be acquired as "uneconomic remnants" (land that would be isolated from surrounding areas because of project construction).

TABLE 3
BAYOU SORREL LOCK REPLACEMENT PROJECT
PROJECT MITIGATION

AREA	AREA LOCATION	EXISTING HABITAT TYPE	ACRES	FWOP AAHUs	FWP AAHUs	NET AAHUs
I_1	Northernmost existing disposal area - to be used for disposal and managed	BLH composed entirely of large, tall willows	24.5	6.46[1]	11.22	4.76
K_1	West side of East Access Channel, north of disposal areas - to be planted and managed	Mixed BLH - some small red maple and willows	4.1	1.03[1]	1.89	0.86
N_1	Existing disposal area - to be used for disposal and managed	Mostly small willows and sycamores	17.2	4.14[1]	7.61	3.47
O (BLH)	Existing disposal area - only a small amount of capacity used so far	BLH portion of existing disposal area	50.9	14.85	25.93	11.08
O (CS to BLH)	Existing disposal area - only a small amount of capacity used so far	Cypress swamp that would convert to BLH w/o project	21.8	5.36	17.06	11.70
R & S	Existing disposal areas that would be used for disposal without the project	Mixed re-generating BLH	103.2	26.12	33.27	7.15
T (BLH)	Site of future disposal area that would be necessary without the project	BLH portion of area	52.2	37.95	46.64	8.69
T (CS to BLH)	Site of future disposal area that would be necessary without the project	Cypress swamp that would convert to BLH w/o project	52.1	42.39	53.50	11.11
1	Existing lock tailbay channel to be used for disposal and managed	Open water	14.9	0.00	4.11	4.11
2	Existing lock chamber to be used for disposal and managed	Open water and cleared land	10.1	0.00	3.12	3.12
3	Existing lock forebay channel to be used for disposal and managed	Open water	47.4	0.00	3.81	3.81
5	Existing East Access Channel to be used for disposal and managed	Open water	8.1	0.00	2.47	2.47
		Total	406.5	126.67	210.63	72.33

AAHUs - Average Annual Habitat Units

BLH - Bottomland Hardwood Forest

CS - Cypress Swamp

[1] Areas I_1, K_1, and N_1 would be impacted by the project and would also be used for mitigation.

Acreage reforested during construction - 45.8

Acreage reforested over time - 80.5

AAHUs from avoidance of impacts - 49.73

AAHUs from compensatory mitigation - 22.6

TABLE 4
BAYOU SORREL LOCK REPLACEMENT - MITIGATION REQUIREMENTS AND COSTS
FOREST DEVELOPMENT AND MANAGEMENT FEATURES

Year	Relative Year	Acres	Area(s)	Activity	Cost/acre ($)	Total Cost ($)
2008	Last year of project construction	45.8	I1, K1, & N1	Bulldoze undesirable trees	1,500	68,700
		45.8	I1, K1, & N1	Plant seedlings	200	9,160
2009	1st year after project completion	45.8	I1, K1, & N1	Monitoring & report	50	2,290
		45.8	I1,K1,&N1	Replant where necessary	200 [1]	2,290
2013	5th year after project completion	18.2	2&5	Plant seedlings	200	3,640
		45.8	I1,K1,&N1	Reduce competing vegetation	500	22,900
2014	6th year after project construction	64	I1,K1,N1,2&5	Monitoring & report	50	3,200
		18.2	2&5	Replant where necessary	200 [1]	2,000 [2]
2018	10th year after project completion	14.9	1	Plant seedlings	200	2,980
		18.2	2&5	Reduce competing vegetation	500	9,100
2019	11th year after project completion	78.9	I1,K1,N1,2,5,&1	Monitoring & report	50	3,945
		14.9	1	Replant where necessary	200 [1]	2,000 [2]
2024	16th year after project construction	78.9	I1,K1,N1,2,5,&1	Monitoring & report	50	3,945
		14.9	1	Reduce competing vegetation	500	7,450
2028	20th year after project construction	78.9	I1,K1,N1,2,5,&1	Monitoring & report	50	3,945
2033	25th year after project construction	78.9	I1,K1,N1,2,5,&1	Monitoring & report	50	3,945
2043	35th year after project completion	47.4	3	Plant seedlings	200	9,480
		126.3	I1,K1,N1,2,5,1,&3	Monitoring & report	50	6,315
2044	36th year after project completion	47.4	3	Monitoring & report	50	2,370
		47.4	3	Replant where necessary	200 [1]	2,370
2048	40th year after project completion	47.4	3	Reduce competing vegetation	500	23,700
2053	45th year after project construction	126.3	I1,K1,N1,2,5,1,&3	Monitoring & report	50	6,315
					Total (First Cost)	202,040

[1] Replanting is assumed necessary over 25% of the originally planted area. The costs reflect the cost per acre multiplied by 0.25
[2] The minimal cost shown for any effort is $2,000, even if the calculated cost is less.

MONITORING

Compensatory mitigation for project impacts would occur during project construction and over the life of the project. During operation and maintenance of the project, monitoring of the mitigation plan would be necessary in order to determine the degree of success and to apply adaptive management if problems arise. Costs for monitoring the mitigation plan are included in the project cost estimate and are shown in Table 4. Monitoring is planned 1 year after the end of project construction and about every 5 years afterwards. It is anticipated that monitoring would be accomplished through the Park Manager of the USACE, New Orleans District's, Atchafalaya Basin Floodway System, Louisiana, project.

COST EFFECTIVENESS/INCREMENTAL ANALYSIS

The Institute for Water Resources (IWR) Decision Support Software program IWR-PLAN 3.0 was used to display the mitigation increments proposed. All increments are independent, so any increment could be constructed with or without another increment. The input data is shown in Table 5. The outputs are shown in Table 6 and graphically in Figure 3.

Figure 3 shows graphically how nearly 50 AAHUs of mitigation credit is achieved at no cost, due to the mitigation credit received by avoiding the habitat impacts that would occur from annual maintenance dredging under the future without project condition. The remaining mitigation increments show ever increasing incremental costs up to the point where 103 percent mitigation is achieved at 72.33 AAHUs. There is a large incremental cost increase per AAHU with the increment crossing the 60 AAHU mark. That increment includes the reforestation of an area later in the project life that would not achieve its optimal habitat value until after the period of analysis (53 years). The last three increments are also high in incremental cost. Those increments are the reforestation of existing disposal areas that would have to be prepared by bulldozing in order to prepare them for reforestation. The bulldozing cost is the main factor in the high cost of those increments.

The cost effectiveness analysis shows that up to 71 percent of the mitigation necessary for compensate for project impacts could be achieved at no cost. The remaining mitigation increments are recommended for implementation because they would fully mitigate for adverse impacts of the project as documented in the HAM analyses. The implementation of these mitigation increments would achieve produce high quality wildlife habitat on Government-owned property and demonstrate that the Government is committed to being a good steward of its own property. Without the proposed mitigation features, 126 acres of the land on the Government-owned property at Bayou Sorrel would develop into an unmanaged, low quality scrub/shrub and woodland habitat.

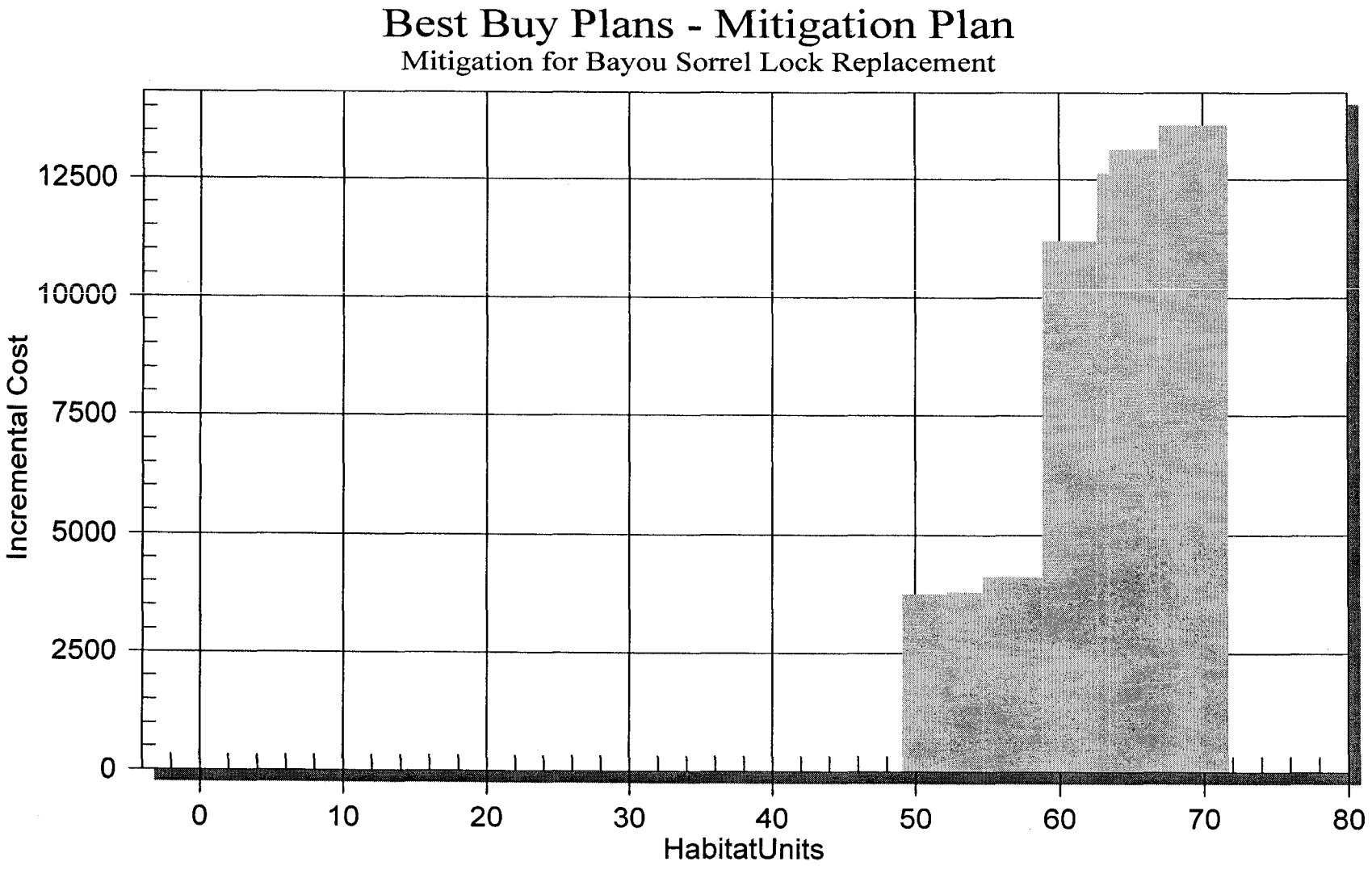
SOLUTION LEGEND

Solution	Scale Code	Solution Description	Scale Description
A	0	Area O (BLH)	No Action
A	1	Area O (BLH)	Area O (BLH)
B	0	Area O (CS to BLH)	No Action
B	1	Area O (CS to BLH)	Area O (BLH-CS)
C	0	Areas R&S	No Action
C	1	Areas R&S	Areas R&S
D	0	Area T (BLH)	No Action
D	1	Area T (BLH)	Area T (BLH)
E	0	Area T (CS to BLH)	No Action
E	1	Area T (CS to BLH)	Area T (CS-BLH)
F	0	Area I1	No Action
F	1	Area I1	Area I1
G	0	Area K1	No Action
G	1	Area K1	Area K1
H	0	Area N1	No Action
H	1	Area N1	Area N1
I	0	Area 1	No Action
I	1	Area 1	Area 1
J	0	Area 2	No Action
J	1	Area 2	Area 2
K	0	Area 3	No Action
K	1	Area 3	Area 3
L	0	Area 5	No Action
L	1	Area 5	Area 5

Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Mitigation Pla

Counter	Plan Code	HabitatUnits (AAHU's)	TotalCost ($)	Avg. Cost $ / AAHU's	Inc. Cost ($)	Inc. Output (AAHU's)	Incremental Cost Per Output
1	A1 B1 C1 D1 E1 F0 G0 H0 I0 J0 K0 L0	49.10	0.00	0.0000	0.0000	49.1000	0
2	A1 B1 C1 D1 E1 F0 G0 H0 I0 J1 K0 L0	52.22	11,720.00	224.4351	11,720.0000	3.1200	3756.41
3	A1 B1 C1 D1 E1 F0 G0 H0 I0 J1 K0 L1	54.69	21,110.00	385.9938	9,390.0000	2.4700	3801.619
4	A1 B1 C1 D1 E1 F0 G0 H0 I1 J1 K0 L1	58.80	38,010.00	646.4286	16,900.0000	4.1100	4111.922
5	A1 B1 C1 D1 E1 F0 G0 H0 I1 J1 K1 L1	62.61	80,670.00	1,288.4520	42,660.0000	3.8100	11196.85
6	A1 B1 C1 D1 E1 F0 G1 H0 I1 J1 K1 L1	63.47	91,535.00	1,442.1770	10,865.0000	0.8600	12633.72
7	A1 B1 C1 D1 E1 F0 G1 H1 I1 J1 K1 L1	66.94	137,115.00	2,048.3270	45,580.0000	3.4700	13135.45
8	A1 B1 C1 D1 E1 F1 G1 H1 I1 J1 K1 L1	71.70	202,040.00	2,817.8520	64,925.0000	4.7600	13639.71


Best Buy Plans - Mitigation Plan
Mitigation for Bayou Sorrel Lock Replacement
Incremental Cost
12500
10000
7500
5000
2500
0
0
10
20
30
40
50
60
70
80
HabitatUnits